

S/N 10/004,567

Page 3

CISCO-4758

**AMENDMENT(S) TO THE CLAIMS:**

The following listing of claims will replace all prior versions, and listings, of claims on the application. All claims are set forth below with one of the following annotations.

- (Original): Claim filed with the application.
- (Currently amended): Claim being amended in the current amendment paper.
- (Canceled): Claim cancelled or deleted from the application. No claim text is shown.
- (Withdrawn): Claim still in the application, but in a non-elected status.
- (New): Claim being added in the current amendment paper.
- (Previously presented): Claim added or amended in an earlier amendment paper.
- (Not entered): Claim presented in a previous amendment, but not entered or whose entry status unknown. No claim text is shown.

1. (Currently amended) An apparatus Apparatus for transmitting an OFDM signal, said apparatus comprising:

a transform block that converts a group of subcarriers of an OFDM symbol to a set of time domain samples of said OFDM symbol to form a time domain burst; and

a frequency domain mapping block that assigns modulated subcarriers of said group to subchannels of said OFDM symbol so that said transform block outputs a time domain digital signal positioned at an ~~IF~~ intermediate frequency (IF), and that adjusts values of subcarriers of said group of subcarriers so that said samples of said OFDM symbol have strictly real values,

such that there are a total of N values for N positive and negative frequency subchannels to be converted to the set of real valued time domain samples,

wherein the transform block includes a preprocessor to map the series of N values to a first series of N/2 values using a first mapping function, an n/2-point transformer to perform an inverse discrete Fourier transform on said first

S/N 10/004,567

Page 4

CISCO-4758

N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and a postprocessor to map real and imaginary components of said second N/2-point complex-valued series to the set of real valued time domain samples using a second mapping function.

2. Cancelled.
3. (Original) The apparatus of claim 1 further comprising a cyclic prefix block that adds a cyclic prefix to said time domain burst.

4. (Currently amended) The apparatus of claim 3 further comprising:  
a digital to analog converter that generates an analog signal derived from an output ~~output~~ of said transform block without time domain digital filtering.

5. (Currently amended) An apparatus ~~Apparatus~~ for receiving an OFDM signal, said apparatus comprising:

a cyclic prefix removal block to remove a cyclic prefix from samples of a received time domain OFDM signal to provide a series of N received time domain samples;

a transform block that converts the series of N received time domain samples to a frequency domain OFDM symbol comprising a set of complex valued subcarriers; and

a frequency domain symbol processing block that selects subcarriers of said frequency domain OFDM symbol centered at an IF intermediate frequency (IF) as baseband frequency domain symbols, thereby frequency shifting said selected subcarriers to baseband

wherein the series of N received time domain samples are real-valued, and wherein the transform block includes a preprocessor to map the series of N received time domain samples to a first series of N/2 values using a first mapping function, a transformer to perform an FFT on said first N/2-point series to obtain a second N/2-point series of values; and a postprocessor to

S/N 10/004,567

Page 5

CISCO-4758

map the N/2-point set of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels, including the selected subcarriers to be shifted to baseband, the postprocessor using a second mapping function.

6. Cancelled.

7. (Original) The apparatus of claim 5 further comprising:

an analog to digital converter that converts an IF analog signal to provide said time domain samples without time domain digital filtering.

8. (Currently amended) The apparatus of claim 7 ~~claim 5~~ wherein said analog to digital converter ~~over-samples~~ oversamples said analog signal.

9. (Currently amended) A method for transmitting an OFDM signal, said method comprising:

assigning subcarriers to subchannels centered around an ~~IF~~ intermediate frequency (IF) within an OFDM frequency domain symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

converting said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples; the converting of including:

mapping the N values to a first series of N/2 values using a first mapping function;

performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to a set of real valued time domain samples using a second mapping function; and

S/N 10/004,567

Page 6

CISCO-4758

transmitting a signal based on said real-valued time domain samples.

10. (Original) The method of claim 9 further comprising:

generating an analog signal based on said time domain samples without time domain digital filtering.

11. (Currently amended) A method of using an N/2-point transform to transform an N-point ~~a N-point~~ complex-valued series to an N-point real-valued series, said method comprising:

mapping said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

performing an inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to said N-point real-valued series using a second mapping function.

12. (Currently amended) The method of claim 11 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$

$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein  $A + B = N$ ,  $R(m)$  is a real component of an  $m$ th point of said first N/2-point complex-valued series,  $I(m)$  is an imaginary component of said  $m$ th point;  $X_r(p)$  is a real component of a  $p$ th point of said N-point ~~N-point~~ complex-valued series, and  $X_i(p)$  is an imaginary component of said  $p$ th point.

S/N 10/004,567

Page 7

CISCO-4758

13. (Currently amended) The method of claim 11 wherein said second mapping function comprises:

$x(2k) = y_r(k)$ ,  $x(2k+1) = y_i(k)$  wherein  $x(p)$  is a real-only value of a  $p$ th component of said N-point real-valued series,  $y_r(k)$  is a real component of a  $k$ th complex point of said second N/2-point N/2 complex-valued series, and  $y_i(k)$  is an imaginary component of said  $k$ th complex point.

14. (Currently amended) A method for receiving an OFDM signal, said method comprising:

converting a series of N real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using a transform an N/2-point transform, including:

mapping the series of N real-valued time domain samples to a first series of N/2 values using a first mapping function;

transforming the first series using the N/2 point transformer to perform an FFT on said first N/2-point series to obtain a second N/2-point series of values; and

mapping the N/2-point series of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels using a second mapping function; and

selecting subcarriers from said frequency domain symbol to effect a frequency shift from an IF intermediate frequency (IF) to baseband.

15. (Cancelled).

16. (Original) The method of claim 14 further comprising:

converting an IF analog signal to a digital signal used to generate said time domain samples without time domain digital filtering.

S/N 10/004,567

Page 8

CISCO-4758

17. (Currently amended) The method of claim 16 ~~claim 15~~ wherein converting comprises oversampling said IF analog signal.

18. (Currently amended) An apparatus ~~Apparatus~~ for transmitting an OFDM signal, said apparatus comprising:

means for assigning subcarriers to subchannels centered around an IF intermediate frequency (IF) within an ~~OFDM frequency~~ a frequency domain OFDM symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

means for converting said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples; the means for converting of including:

means for mapping the N values to a first series of N/2 values using a first mapping function;

means for performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

means for mapping real and imaginary components of said second N/2-point complex-valued series to a set of real valued time domain samples using a second mapping function; and

means for transmitting a signal based on said time domain samples.

19. (Currently amended) An apparatus ~~Apparatus~~ for receiving an OFDM signal, said apparatus comprising:

means for converting a series of N real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using a ~~a transform~~ an N/2-point transform, the means for converting including:

S/N 10/004,567

Page 9

CISCO-4758

first mapping means for mapping the series of N real-valued time domain samples to a first series of N/2 values using a first mapping function;

means for transforming the first series using the N/2 point transformer to perform an FFT on said first N/2-point series to obtain a second N/2-point series of values; and

second means for mapping the second N/2-point series of values to a total of N real and imaginary valued subcarriers at a corresponding set of N frequency subchannels using a second mapping function; and

means for selecting subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an IF intermediate frequency (IF) to baseband.

20. (Currently amended) A computer program product for transmitting an OFDM signal, said computer program product comprising:

code that assigns subcarriers to subchannels centered around an IF intermediate frequency (IF) within a frequency domain OFDM symbol to implement a frequency shift to that IF such that there are a total of N values for N positive and negative frequency subchannels;

code that converts said N values for N subchannels of the frequency domain OFDM symbol to real-valued time domain samples, including code for:

mapping the N values to a first series of N/2 values using a first mapping function;

performing an N/2-point inverse discrete Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to a set of real valued time domain samples using a second mapping function; and

S/N 10/004,567

Page 10

CISCO-4758

code that causes a transmitter to transmit transmit a signal based on said real-valued time domain samples; and

a computer-readable storage medium that stores the codes.

21. (Cancelled).

22. (Currently amended) A computer program product for using an N/2-point to transform N-point complex-valued series to an N-point real-valued series, said computer program product comprising:

code that maps said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

code that performs an inverse fast Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point ~~N/2~~ complex-valued series;

code that maps real and imaginary components of said second N/2-point complex-valued series to the N-point complex-valued ~~real-valued~~ series using a second mapping function; and

a computer readable storage medium that stores the codes.

23. (Currently amended) The computer program product of claim 22 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$

$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$

$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein  $A + B = N$ ,  $R(m)$  is a real component of an  $m$ th point of said first N/2-point complex-valued series,  $I(m)$  is an imaginary component of said  $m$ th

S/N 10/004,567

Page 11

CISCO-4758

point;  $X_r(p)$  is a real component of a  $p$ th point of said ~~N-point~~  $N$ -point complex-valued series, and  $X_i(p)$  is an imaginary component of said  $p$ th point.

24. (Currently amended) A computer program product for receiving an OFDM signal, said computer program product comprising:

code that converts a series of  $N$  real-valued time domain samples of a received OFDM signal to a frequency domain OFDM symbol using a transform an  $N/2$ -point transform, the code that converts including code for:

mapping the series of  $N$  real-valued time domain samples to a first series of  $N/2$  values using a first mapping function;

transforming the first series using the  $N/2$  point transformer to perform an FFT on said first  $N/2$ -point series to obtain a second  $N/2$ -point series of values; and

mapping the  $N/2$ -point series of values to a total of  $N$  real and imaginary valued subcarriers at a corresponding set of  $N$  frequency subchannels using a second mapping function;

code that selects subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an ~~IF~~ intermediate frequency (IF) to baseband; and

a computer-readable storage medium that stores the code that converts and the code that selects.

25. (Cancelled)